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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/034,221	12/28/2001	Seung Ho Pyi	CU-2755 VE	9078

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EXAMINER	
ANDERSON, MATTHEW A	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 06/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/034,221	PYI, SEUNG HO	
	Examiner	Art Unit	
	Matthew A. Anderson	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) *14-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Claims 14-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Invention II, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.

2. Applicant's election without traverse of Invention I in Paper No. 6 is acknowledged.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 4, 5, 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Wolf et al. (,Silicon Processing for the VLSI Era Volume 1: Process Technology, Lattice Press, Sunset Beach, CA, USA, pp. 1-35,59-61, 124-159, 1986.

Wolf et al. discloses known technology for the Si semiconductor industry. Cz (Czochralski) pulling and float zone methods are used to form Si single crystals from a

melt of Si which also usually contains dopants (page 8, 15). Cz Si is known to have oxygen and carbon impurities in sufficient quantities to measure (page 19). On page 6, this carbon is described as coming from the reduction reaction to produce Si metal from SiO_2. On page 9, Cz pulling is described as inherently having the provision of a quantity of Si in a crucible which is then melted. The chamber is filled with inert gas and a slim rod of seed crystal is introduced into the melt. The diameter of the crystal is controlled to form a neck before a shoulder is formed at the start of the more-or-less constant diameter pulling of the ingot main body. The incorporation of C into Si as Si cools is described on page 12. Starting on page 23 it is detailed how Si ingots are prepared. Sawn ingots yield wafers. The wafers are the shaped and polished and then usually etched to remove any contaminants. Chemical-mechanical polishing is used to give a mirror finish. Epitaxial wafers can then be grown from the mirror polished wafers. Properties and requirements for VLSI Si are given on page 27. Carbon in ppma is 1-5 for Cz growth. Oxygen is 5-25 in ppma. Carbon content is described on page 30 as low at about 1 ppma. On page 59, suitable means for comparison between ppma and atom/cm^3 notation exists as to these impurity concentrations. 10-20 ppma is described as equivalent to $5x10^{17} - 1x10^{18}$ atoms/cm^3. On page 124 Si epitaxial films are described as grown in thickness from 0.5 to 20 μm to form active regions in which to form bipolar transistors, bipolar integrated circuits, and CMOS VLSI circuits.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2, 3, 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf et al. as applied above.

Wolf et al. is described above.

Wolf et al. does not explicitly specify the claimed concentration ranges of oxygen and carbon.

In respect to claims 2, 8, it would have been obvious to one of ordinary skill in the art at the time of the present invention to have concentration of C of $1x10^{14}$ to $5x10^{17}$ atoms C/cm3 because Wolf et al. suggests that approximately this concentration of carbon is present in Cz Si because of the reduction of SiO2 by C to obtain the Si metal.

In respect to claim 3, 9, it would have been obvious to one of ordinary skill in the art at the time of the present invention to have a concentration of oxygen in the Si of between 8-13 ppma because Wolf et al. suggests between 5-25 ppma oxygen (or 10-20 on page 59).

In respect to claim 7, it would have been obvious to one of ordinary skill in the art at the time of the present invention to mix carbon with the Si and then melting together

the Si and C to form a melt because Wolf et al. suggests just such Si with C impurity as being common in the art. Carbon concentration is typically 1-5 ppma.

In respect to claim 10, it would have been obvious to one of ordinary skill in the art at the time of the present invention to form an epitaxial layer of thickness 0.5 –5 microns because Wolf suggests anywhere from 0.5 to 20 μm thickness.

In respect to claim 11-13, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the epitaxial layer to form active layers, to form the ingot by a Cz method, and to surface and edge polish the wafers cut from the ingot because Wolf et al. describes these steps as very commonly performed in Si semiconductor processing.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Matthew Anderson
A.U. 1765

MAA
June 3, 2003